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Sexual quality of life after hysterectomy performed by conventional laparoscopy versus Vaginal Natural Orifice Transluminal Endoscopic Surgery (vNOTES) in benign gynaecology

Marie Timmermans[1], Hripsime Hovsepyan[2], Panayiotis Tanos[2], Michelle Nisolle[1], Stavros Karampelas[2]

[1]Department of Obstetrics and Gynaecology, University of Liège, CHU of Liège-Citadelle site, Liège, Belgium
[2]Department of Obstetrics and Gynaecology, Centre Hospitalier Universitaire Brugmann, Université Libre de Bruxelles, Brussels, Belgium

ABSTRACT

Background: Hysterectomy is a common surgical procedure in gynaecology, performed through abdominal, vaginal, and laparoscopic techniques. The vaginal route is typically preferred for benign conditions like fibroids, adenomyosis, and uterine prolapse due to shorter operative time, faster recovery, reduced pain, and fewer complications. In cases where the uterus is large or vaginal access is restricted, a laparoscopic approach may be necessary. A minimally invasive alternative, Vaginal Natural Orifice Transluminal Endoscopic Surgery (vNOTES), allows hysterectomy via vaginal access using a combination of endoscopic and laparoscopic techniques.

Objectives: To evaluate if sexual quality of life (sQoL) is impaired by using vNOTES for hysterectomy compared to conventional laparoscopy in benign gynaecology.

Methods: A retrospective monocentric study. One hundred and twenty seven patients were included in the study. Of these, 91 underwent TLH and 36 vNOTES hysterectomies between September 2020 and October 2022 at Brugmann University Hospital.

Main Outcome Measures: This study compares sQoL after hysterectomy performed via conventional laparoscopy versus vNOTES for benign gynecological conditions.

Results: Regarding surgical characteristics, there were no differences between the two groups in terms of operative time, drop in blood haemoglobin levels and days of hospitalisation. Arousal and Orgasm scores are improved post-operatively in patients suffering from adenomyosis (4.47 vs. 3.91 *P* 0.04 for arousal and 5.07 vs. 4.26, *P* 0.016 for orgasm).

Conclusions: The vNOTES method shows shorter hospital stay and faster re-introduction to sexual life over conventional laparoscopy for total hysterectomy in patients with benign gynaecology.

What is New: Our study shows that in patients suffering from adenomyosis, sQoL improved after hysterectomy using the vNOTES approach.

Keywords: Adenomyosis, hysterectomy, laparoscopy, vNOTES, sexual quality of life

Corresponding Author: Panayiotis Tanos, MD, Department of Obstetrics and Gynecology, Centre Hospitalier Universitaire Brugmann, Université Libre de Bruxelles, Brussels, Belgium
E-mail: p.tanos@outlook.com **ORCID ID:** orcid.org/0000-0001-5742-0995
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Introduction

Hysterectomy is one of the most common surgical procedures in gynaecology, performed through different approaches like abdominal, vaginal, laparoscopic total (TLH) or laparoscopically assisted vaginal hysterectomy.[1] In benign conditions such as leiomyomas, adenomyosis, menometrorrhagia, uterine prolapse or chronic pelvic pain,[2] the vaginal route is preferred as it allows shorter operating time, faster recovery time, reduced pain, number of hernias at surgical site and can have better aesthetic appeal.[3] The laparoscopic approach is necessary in case of large uterus, limited vaginal access, or history of abdomino-pelvic adhesions, and endometriosis. However, this technique increases the risk of injury to the urinary or digestive tracts.[4,5]

The minimally invasive technique Vaginal Natural Orifice Transluminal Endoscopic Surgery (vNOTES) allows hysterectomy to be performed using a combined endoscopic view and laparoscopic instrumentation, with the vagina used as an access route to the peritoneal cavity.[6] Firstly described in 2007 for cholecystectomy,[7] vNOTES feasibility and safety were demonstrated for hysterectomy in 2012.[8] Contraindications include history of pelvic infection disease, previous rectum surgery, endometriosis at the pouch of Douglas, previous multiple pelvic surgeries, pelvic radiotherapy, and severe genital prolapse.

So far, few studies have compared vNOTES with TLH in operative time, length of hospital stay, postoperative pain, and intra- and postoperative complications.[9,10] However, the literature lacks data on dyspareunia, well-being and sexual quality of life (sQoL) in patients undergoing vNOTES. The main objective of this study is to evaluate and compare the quality of sexual life (QSL) of patients undergoing hysterectomy by vNOTES and by TLH. Our secondary objective is to determine if there is improvement in adenomyosis patients as about 40% of the population undergoing hysterectomy present with adenomyosis.[11,12]

Methods

Study Design

This is a single-centre retrospective observational study conducted at Brugmann University Hospital in the Gynaecology Department between September 2020 and October 2022. This study was reviewed and approved by the Ethics Committee of the Brugmann University Hospital under reference number B0772022000153, date: 14.02.2023.

We established our database according to the following inclusion criteria: women over 18 years of age, who underwent hysterectomy by laparoscopic or by vNOTES methods for benign indications such as drug-resistant menometrorrhagia, polyfibromatous uterus or adenomyosis. A total of 127 patients underwent hysterectomy for these benign indications.

Surgical Procedures

All procedures, vNOTES or TLH, were performed by the same team, experienced in laparoscopic surgery. vNOTES was performed under general anaesthetic, with the patient installed in the gynaecological position. After disinfection, placement of sterile drapes and indwelling urinary catheter, peritoneal exposure and opening were performed. A circular pericervical colpotomy was undertaken, then the bladder was dissected down to the vesico-uterine peritoneal fold, giving access to the peritoneal cavity anteriorly. The pouch of Douglas was opened and the uterosacral ligaments of the paracervix were sectioned, ligated and reattached to the vaginal angles. The vNOTES was then installed as follows. After peritoneal rinsing, an Alexis retractor was placed. The uterus was downwardly attracted using Pozzi forceps. A posterior right-angled valve was placed in the pouch of Douglas and a long anterior right-angled valve, anterior to the uterus, was placed in the peritoneal cavity. Afterwards, 2/3 of the inner ring was inserted over the anterior valve before sliding the remaining third against the posterior valve in the Douglas, and the Alexis retractor was tensioned by winding the outer ring 2 turns. An optical trocar and 3 x 5 mm operating trocars were inserted. The trocars were then positioned on the vNOTES platform: 2 operating trocars at 10 and 2 o'clock and the optical trocar and third trocar at 5 and 7 o'clock on the Gel point™ platform. This platform was attached to the outer ring of the Alexis retractor, and insufflation was performed at a low pressure of 8 mmHg. Hysterectomy was performed after peritoneal exploration. After right lateralisation of the uterus, the uterine pedicle was resected after thermo-fusion, and the broad ligament was released. A vascular anastomosis was performed between the uterine pedicle and the utero-ovarian ligament was resected. After left lateralisation of the uterus, the same procedures were repeated on the contralateral side. The uterine pedicles, utero-ovarian and round ligaments were bilaterally resected, and the uterus released. The exsufflation was performed, the Alexis retractor removed, and haemostasis checked. Monocryl 0 was used to close the vagina. The urinary the

catheter was removed. TLH was performed as standard practice by following the validated 10 steps described by the European Society of Gynaecological Endoscopy working group in 2019. After both surgical procedures, paracetamol and non-steroidal anti-inflammatory drugs were prescribed for 48 hours.

Sexual Life Quality Evaluation

The main objective of this study was to assess the QSL in patients at least 3 months after surgery, and to compare it between the two groups (vNOTES and TLH). The Female Sexual Function Index (FSFI)[13] was completed by patients during telephone interviews after informed consent had been obtained. The questionnaire covers the following six areas: desire, subjective arousal, lubrication, orgasm, satisfaction and pain. A total score is calculated, and a threshold value is predefined (26.55). A score below or equal to this threshold implies female sexual dysfunction.

Collected Data

Descriptive patient characteristics (age, body mass index, gestational age, parity) and intra- and post- operative data were extracted from medical records. Intra- and post- operative data consisted in operative time, blood loss, change in haemoglobin level, length of hospital stay, pre-operative symptoms, operative complications and duration of postoperative analgesia.

Statistical Analysis

Data were analysed using R software version 3.6.2 (R Core Team 2014). Continuous variables were expressed as median (standard deviation), while categorical variables were expressed as numbers (frequencies). The normal distribution of continuous variables was assessed by QQ plots, and the homogeneity of variances by Levene's test. To detect a statistically significant difference between the "laparoscopy" and "vNOTES" groups, the chi-square or Fisher's exact test was used to compare categorical variables. The t-test or Mann-Whitney U test was used to compare continuous variables. A *P*-value <0.05 was considered statistically significant.

Results

Patient Characteristics

Initially, 127 patients were included in the study. Of these, 91 underwent TLH and 36 vNOTES hysterectomies. Table 1 shows the different results concerning patient characteristics. There was no significant difference in age or body mass index between the two groups.

Regarding surgical characteristics, there were no differences between the two groups in terms of operative time, drop in blood haemoglobin levels and days of hospitalisation. However, significant differences were observed between TLH and vNOTES regarding to total blood loss (respectively, 166.1 mL vs. 286.4 mL, *P* 0.007) and uterine weight (respectively 445.1 g vs. 305.3 g, *P* 0.022). For the period of postoperative analgesic administration, the mean duration was 8.9 days for the TLH group and 6.7 days for the vNOTES group. This the

Table 1. General and surgical characteristics of the general population (n=127) according to type of surgery.

	General population (n=127)		
Variables	**TLH (n=91)**	**vNOTES (n=36)**	***P*-value**
Age (years)	46.9 (5.4)	46.6 (4.9)	0.759
BMI (kg/m²)	28.5 (5.2)	30.3 (7.2)	0.180
Gestity	2.3 (1.6)	3.4 (2.0)	0.002*
Parity	1.8 (1.3)	2.8 (1.6)	0.001*
Operative time (min)	174.2 (66.3)	152.6 (60.4)	0.093
Total blood loss (mL)	166.1 (211.5)	286.4 (248.6)	0.007*
Haemoglobin drop (g/dL)	2.3 (3.2)	2.1 (1.1)	0.521
Hospital stay (days)	2.5 (1.1)	2.0 (2.4)	0.243
Analgesic intake (days)	8.9 (10.0)	6.7 (11.1)	0.305
Uterine weight (g)	445.1 (419.3)	305.3 (246.3)	0.022*
Adenomyosis	35 (38.5)	18 (50.0)	0.235
Complications	4 (4.4)	5 (13.9)	0.12

Data is presented as mean (standard deviation) or frequency (%). Complications: hemoperitoneum, infection, bladder injury, ureter injury, bowel injury.
*Significant difference, BMI: Body mass index, TLH: Total laparoscopic hysterectomy, vNOTES: Vaginal Natural Orifice Transluminal Endoscopic Surgery.

difference was not statistically significant. According to histopathological diagnosis, 38.5% of patients in the TLH group had adenomyosis, compared with 50.0% in the vNOTES group.

Comparison of sQoL After Hysterectomy by TLH and vNOTES

We aimed to determine if the sQoL was impacted by the surgical technique. We focused on the sexually active population, meaning 66 of the 127 patients who declared themselves sexually active and completed the FSFI questionnaire. This corresponded to 42.9% of the TLH group and 75.0% in the vNOTES group ($P < 0.01$). The general characteristics of this sub-population are summarised in Table 2.

Of these 66 patients, 39 underwent TLH and 27 vNOTES. Patients who underwent vNOTES had significantly more pregnancies and deliveries. Surgically, vNOTES induced greater total blood loss (301.5 mL vs. 176.8 mL, *P* 0.028) with no difference in haemoglobin drop. Despite this, vNOTES patients were discharged earlier (1.8 days vs. 2.6 days, *P* 0.011).

Regarding histopathological diagnosis, in the TLH group, 33.3% of patients had adenomyosis versus 51.8% in the vNOTES group. This difference was not statistically significant. When we focused on postoperative sQoL, according to the type of surgery (Table 3), we observed that patients who benefited from vNOTES had higher scores than those operated on by conventional laparoscopy, which was statistically significant for arousal,

Table 2. General and surgical characteristics of the postoperative sexually active population (n=66) according to type of surgery.

	Postoperative sexually active population (n=66)		
Variables	**TLH (n=39)**	**vNOTES (n=27)**	***P*-value**
Age (years)	46.6 (0.7)	47.1 (1.0)	0.642
BMI (kg/m²)	28.9 (0.9)	30.6 (1.3)	0.272
Gravidity	2.4 (0.3)	3.4 (0.4)	0.017*
Parity	1.9 (0.2)	2.9 (0.3)	0.005*
Operative time (min)	173.4 (7.4)	149.3 (12.3)	0.080
Total blood loss (mL)	176.8 (31.1)	301.5 (49.1)	0.028*
Haemoglobin drop (g/dL)	2.4 (0.4)	1.9 (0.2)	0.350
Hospital stay (days)	2.6 (0.2)	1.8 (0.3)	0.011*
Analgesic intake (days)	9.1 (1.6)	4.7 (1.5)	0.064
Uterine weight (g)	478.3 (78.6)	312.6 (49.7)	0.080
Adenomyosis	13 (33.3)	14 (51.8)	0.132
Complications	4 (10.2)	2 (7.4)	1

Data are presented as mean (standard deviation) or frequency (%). Complications: Hemoperitoneum, infection, bladder injury, ureter injury, bowel injury.
*Significant difference, BMI: Body mass index, TLH: Total laparoscopic hysterectomy, vNOTES: Vaginal Natural Orifice Transluminal Endoscopic Surgery.

Table 3. FSFI results of the sexually active population (n=66) according to type of surgery.

Variables	**TLH (n=39)**	**vNOTES (n=27)**	***P*-value**
Desire	3.40 (0.20)	3.82 (0.19)	0.138
Arousal	3.87 (0.20)	4.53 (0.17)	0.014*
Lubrication	4.44 (0.28)	4.91 (0.20)	0.173
Orgasm	4.19 (0.24)	5.15 (0.20)	0.003*
Satisfaction	4.21 (0.23)	5.15 (0.17)	0.002*
Pain	4.87 (0.31)	5.39 (0.25)	0.193
Global score	24.99 (1.04)	28.97 (0.80)	0.003*

Data are presented as mean (standard deviation).
*Significant difference, FSFI: Female Sexual Function Index, TLH: Total laparoscopic hysterectomy, vNOTES: Vaginal Natural Orifice Transluminal Endoscopic Surgery.

Table 4. FSFI results of the sexually active population (n=66) according to presence of adenomyosis.

Variables	No adenomyosis (39)	Adenomyosis (27)	*P*-value
Desire	3.45 (0.20)	3.76 (0.21)	0.290
Arousal	3.91 (0.21)	4.47 (0.16)	0.040*
Lubrication	4.61 (0.25)	4.66 (0.27)	0.914
Orgasm	4.26 (0.24)	5.07 (0.22)	0.016*
Satisfaction	4.51 (0.23)	4.73 (0.23)	0.517
Pain	4.94 (0.28)	5.23 (0.31)	0.412
Global score	25.69 (1.05)	27.96 (0.91)	0.107

Data are presented as mean (standard deviation).
*Significant difference, FSFI: Female Sexual Function Index.

Table 5. FSFI results of the sexually active population suffering from adenomyosis (n=27) according to type of surgery.

Variables	TLH (n=13)	vNOTES (n=14)	*P*-value
Desire	3.65 (0.28)	3.86 (0.32)	0.629
Arousal	4.31 (0.20)	4.61 (0.24)	0.365
Lubrication	4.43 (0.43)	4.86 (0.32)	0.433
Orgasm	4.86 (0.30)	5.26 (0.33)	0.387
Satisfaction	4.34 (0.36)	5.08 (0.28)	0.118
Pain	5.35 (0.46)	5.23 (0.43)	0.844
Global score	26.95 (1.34)	28.90 (1.23)	0.292

Data are presented as mean (standard deviation).
*Significant difference, FSFI: Female Sexual Function Index, TLH: Total laparoscopic hysterectomy, vNOTES: Vaginal Natural Orifice Transluminal Endoscopic Surgery.

orgasm, and overall sexual satisfaction. The total sQoL score in the vNOTES group was significantly better than in the TLH group (*P* 0.003). Their overall score was above the the cut-off of 26.55, indicating satisfaction with sQoL.

When we analysed our results depending on the presence of adenomyosis, we obtained the values described in Table 4. Only arousal and orgasm scores were improved post-operatively in patients suffering from adenomyosis (4.47 vs. 3.91 *P* 0.04 for arousal and 5.07 vs. 4.26, *P* 0.016 for orgasm). No other results were significantly different. However, the FSFI global score was over the threshold of 26.55 in patients with adenomyosis. If we compared the two techniques inside our adenomyosis population only (Table 5), no difference was observed in FSFI results.

Discussion

Only a few significant differences were observed between TLH and vNOTES when applied for benign indication. These concerned uterine weight, total blood loss, hospital stay, sexual intercourse continuation and sQoL.

It was previously demonstrated that 30 cases are required to reach a learning curve plateau in vNOTES.[14,15] Our the surgical team had reached the plateau of this learning curve while demonstrating no impact on patients' post-operative recovery. The vNOTES group experienced significant bleeding in the general population (286.4 vs. 166.1 mL, *P* 0.007) but this was not related to experience. As vaginal access to the peritoneum requires a colpotomy, bleeding often occurs due to the access through a highly vascularised area. Sometimes the cleavage plane is incorrect or the endocervical myometrium is dissected by mistake.[16] Nevertheless, none of the patients had required blood transfusion.

We observed a difference in hospital stay between the two techniques only if we focused on the sexually active group. The vNOTES sexually active group was discharged earlier (1.8 vs. 2.6 days, *P* 0.011) with a trend of shorter analgesic intake duration postoperatively (almost the half). This is in line with the recent study of Kaya et al.[17], 2021 which showed that the VAS pain score at 6 and 24 hours after surgery was significantly lower in patients operated on with vNOTES. It is important to note that the patients who are discharged earlier feel better earlier and resume intercourse earlier. 75% of women operated with vNOTES, and 42.9% operated by TLH had restarted

sexual activities within 3 months postoperatively (P < 0.01). All of them completed the FSFI questionnaire, which is the gold standard for measuring female sexual function for 20 years.[18,19] In the early use of the vNOTES technique, Su et al. (2012) demonstrated good healing of the vaginal scar, as well as the absence of post-coital bleeding, dyspareunia and discomfort during intercourse In a randomised controlled trial (RCT), Baekelandt et al.[4] did not find any pain during intercourse nor worsening of pre-existing pain 3 and 6 months after the procedure.

Our study stands out for its analysis of patients' sQoL and the identification of a possible sexual dysfunction. Indeed, our results showed that patients who underwent vNOTES surgery had significantly higher scores than those operated on TLH in the areas of arousal, orgasm and satisfaction. The median total score was 28.97 for the vNOTES group and 24.99 for the TLH group (P 0.003). The route to perform the vaginal suture and its effect on sexuality is controversial and very few studies exist on the topic. It seems that laparoscopic cuff closure seems to be preferred because of better postoperative vaginal length and no impact woman sexuality.[20,21] This is confirmed by a RCT performed by Bastu et al.[22], where vaginal versus laparoscopic route for vaginal suture were compared (Bastu et al., 2016). Nevertheless, at 3 months postoperatively, they did not show any difference in FSFI between the two routes of suture. However, in our population, despite vaginal suture, vNOTES gave better results in terms of FSFI global score.

Furthermore, patients suffering from adenomyosis had a better arousal, orgasm and global scores after hysterectomy, independently of the surgical technique used, compared to those not suffering from adenomyosis. We can therefore extrapolate that patients are treated for their adenomyosis while improving their sQoL. However, we cannot demonstrate that vNOTEs is better in this case, as no significant difference was observed between the two techniques. Few publications have described the sexual life quality of women suffering from adenomyosis.[23-25] However, by comparison to endometriosis patients, it could be expected that women with adenomyosis also show the negative impact of their pathology on their sexual life.

Study Limitations

Our study presents limitations due to its retrospective nature from a single centre. The uterine weight in the vNOTES group was smaller (305.3 vs. 445.1 g, P 0.022) due to some selection bias, as our team did not wish to propose this technique for larger uterus. Bias due to different number of births and deliveries between the two groups. Lastly, a baseline preoperative FSFI score should also have been collected to determine further differences in sQoL between the two groups pre-operatively. Our results can be validated by prospective randomised multicentric studies. It is important to note that our team's surgical results in vNOTES include their learning curve as the procedure was only very recently adapted by the team. The main operating surgeon was always the same increasing the reliability of our results. Our results further show vNOTES rapid learning in the case of an experienced laparoscopic surgeon.

Conclusion

vNOTES technique is a plausible operative method for total hysterectomy in patients with benign gynaecological conditions and specifically adenomyosis. vNOTES offers advantages of shorter hospital stay and faster re-introduction to sexual life. In the absence of contraindications, vNOTES can be considered as first-line management option in benign gynaecological surgery.

Ethics

Ethics Committee Approval: This study was reviewed and approved by the Ethics Committee of the Brugmann University Hospital under reference number B0772022000153, date: 14.02.2023.

Informed Consent: Informed consent has been obtained.

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Footnotes

Authorship Contributions

Surgical and Medical Practices: M.T., H.H., P.T., M.N., S.K., Concept: M.T., H.H., P.T., M.N., S.K., Design: M.T., H.H., P.T., M.N., S.K., Data Collection or Processing: M.T., H.H., P.T., M.N., S.K., Analysis or Interpretation: M.T., H.H., P.T., M.N., S.K., Literature Search: M.T., H.H., P.T., M.N., S.K., Writing: M.T., H.H., P.T., M.N., S.K.

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